NASA STTR 2015 Phase I Solicitation

T11.01   Information Technologies for Intelligent and Adaptive Space Robotics

Lead Center: ARC

Participating Center(s): JPL, JSC

The objective of this subtopic is to develop information technologies that enable robots to better support space exploration. Improving robot information technology (algorithms and software) is critical to improving the capability, flexibility, and performance of future missions. In particular, the NASA "Robotics, Tele-Robotics, and Autonomous Systems" roadmap (TA04) indicates that extensive and pervasive use of robots can significantly enhance exploration missions that are progressively longer, complex, and operate with fewer ground control resources.

The performance of intelligent robots is directly linked to the quality and capability of the information technologies used to build and operate them. Thus, proposals are sought that address the following technology needs:

- Advanced robot user interfaces that facilitate distributed collaboration, geospatial data visualization, summarization and notification, performance monitoring, and physics-based simulation. This does NOT include user interfaces for direct teleoperation / purely manual control, telepresence, or virtual reality. The primary objective is to enable more effective and efficient interaction with robots remotely operated with discrete commands or supervisory control.
- Mobile robot navigation for operations in man-made (inside the International Space-Station) and unstructured environments (asteroids, Moon, Mars). Emphasis on multi-sensor data fusion, obstacle detection, and proximity ops. The primary objective is to radically and significantly increase the performance of mobile robot navigation through advanced on-board sensors, perception algorithms and software.
- Robot software architecture that supports adjustable autonomy, on-board health management and prognostics, automated data triage, data management, and data distribution (middleware). The primary objective is to facilitate the creation, extensibility and maintenance of complex robot systems.

Deliverables to NASA:

- Identify scenarios and use cases.
- Define specifications based on design trades.
- Develop concepts to address use cases.
- Build and test prototype systems.
- Perform technology demonstrations.